**ITGS Syllabus**

**Section 2 papers 1 and 2 Resource/revision Tasks/questions**

**The following information and tasks will help develop your knowledge and skills and become more successful in passing papers 1 and 2.**

**PLEASE NOTE The tasks/questions are possibly similar to what may appear on the exam papers and are designed to help you gather a range of information that should benefit you in your revision preparations for the exam.**

**There are five assessment objectives for the ITGS course at SL and eight at HL**

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**Having followed the ITGS course at SL or HL, students will be expected to:**

1. Understand and critically examine the global impact of IT developments

2. Demonstrate a knowledge and understanding of the social and ethical implications of IT systems and developments at the local, national and global level

3. Analyse and evaluate the social and ethical implications of IT developments

4. Express ideas clearly and coherently with supporting arguments and examples.

**In addition to the above, students following the course at SL will be expected to be able to:**

5. Design and apply IT solutions to a problem set in a social context through a project.

**In addition to objectives 1 to 4 above, students following the course at HL will be expected to be able**

**To**:

6. Analyse and evaluate relevant examples of the global impact of IT in a portfolio of individually

Researched studies

7. Demonstrate an ability to synthesize1 and reflect on ideas

8. Demonstrate an ability to project2 the global impact of IT developments

9. Research, analyze and evaluate3 relevant material and examples including “real-life” global or local interactions

**2.1 Basics: hardware and Networks**

2.1.1 Systems Fundamentals

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| Section | objective | Content |
| **2.1.1** |  | **System Fundamentals (3h)** |
| 1 |  | Define hardware. |
| 2 |  | Describe one general function of each of the hardware components of a computer system: input, output, processor (central processing unit) and storage. Students should compare personal computers, palmtop computers, laptops and network computers (NCs) |
| 3 |  | Explain the features commonly used to describe the hardware specifications of a computer system including speed of the CPU, memory, storage, operating system and monitor. |
| 4 |  | Analyze the information concerning the hardware requirements necessary to run software packages. Students should be familiar with the hardware and system specifications printed on the boxes of software packages. |
| 5 |  | Explain 'good practice' including making regular file saves and back-ups, caring for the computer and diskettes, password protection and general computer security. Students should be familiar with making generations of back-ups by using a different file name so that, if a recent version is corrupted, the user can regress to an earlier version |
| 6 |  | Discuss three ergonomic and/or possible health issues arising from the use of computers for extended periods of time, including repetitive strain injury (RSI) and radiation. |
| 7 |  | Discuss the social significance of, and ethical considerations arising from, the greater dependence on computers in institutions/organizations, including loss of jobs, training and retraining. These discussions should involve not only economic aspects, but also psychological, ergonomic, political, cultural aspects, etc |
| 8 |  | Discuss three environmental concerns associated with computers including energy consumption and hardware disposal. Consider the energy required to manufacture, dispose of or recycle computers, as well the energy required to run them. Other aspects concern raw materials and the use of toxic materials. Many countries have specific laws regarding the disposal of hardware and computer supplies, such as laser printer toner and inkjet cartridges. Students should be encouraged to discuss the environmental aspects involved in the packaging and distribution of hardware and computer components. |

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| Section | objective | Content |
| 2.1.1 |  | Operating Systems and **Utilities (4h) Note: System software is used to control the machine, to monitor system activities and to perform maintenance tasks. System software includes the operating system and utility software.** |
| 1 |  | Outline the functions of an operating system including communication with input and output devices, concurrent processing and multitasking, program and data management. Technical details are not required. |
| 2 |  | State at least two different operating systems found in personal computers |
| 3 |  | Explain why the 'boot-up' system is stored in the memory (ROM) of a computer.  The term 'start-up' is sometimes used instead of 'boot-up'. |
| 4 |  | Outline four types of utility program, including one function of each. |
| 5 |  | Explain why a disk defragmenting utility program should be run frequently |
| 6 |  | Describe how to make a back-up. |
| 7 |  | Explain two different situations when back-ups should be made frequently. |
| 8 |  | Compare the advantages and disadvantages of three types of peripherals that are used for back-ups including tape drives and hard disk. Other examples of peripherals are CD-ROMs and diskettes. |
| 9 |  | Describe the difference between a virus, Trojan horse, worm and logic bomb. The last three are erroneously called viruses. |
| 10 |  | Describe three ways a virus program can infect a standalone personal computer.  Examples: the execution of a program that is infected; attempting to boot from a diskette (or other bootable media) that is infected; the execution of a macro that is infected by a 'macro' type virus. |
| 11 |  | Describe two common ways in which a user can be alerted to the presence of a virus. Examples: annoying the user (by displaying messages or making noises); destruction of data/programs. |
| 12 |  | Outline the purpose of a disk recovery program. No technical details are expected |
| 13 |  | Predict the possible economic, political and psychological consequences arising from a community being infected with computer viruses. A community can include a small business, a town, or even a country. Only the major consequences need be considered. |
| 14 |  | Describe three ways in which data can be kept secure. Examples: password; encryption; limited physical access; back-up. |
| 15 |  | State four features of a good password. |
| 16 |  | Explain two ways in which this password can be kept secure. |
| 17 |  | Describe three security systems that use computer technologies to prevent unauthorized access by people to a building |

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| **Section** | **objective** | Section |
| 2.1.1 |  | A Digital World (1h) |
| 1 |  | Define digital data. |
| 2 |  | Define analog data. |
| 3 |  | Discuss two advantages of storing data in digital form compared with analog form. |
| 4 |  | State one disadvantage of storing data in digital form. |

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| Section | objective | Section |
| 2.1.1 |  | Storage (1h) |
| 1 |  | Discuss one advantage and one disadvantage of common storage devices including hard drives, diskettes, CD-ROMs and magnetic tapes. Refer to issues such as security, quality, expense, time and appropriateness |

2.1.2 Networks

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| Section | objective | Section |
| 2.1.2 |  | Networks (5h) |
| 1 |  | Define local area network (LAN). |
| 2 |  | Define wide area network (WAN). |
| 3 |  | Define server. |
| 4 |  | Define client. |
| 5 |  | Outline the basic anatomy of a network with reference to basic topology and the ISO concept of layers. For topology outline the arrangements bus (sometimes called 'linear'), star and ring. Although ISO refers to seven layers for network functions, only three are basic. Bottom (local network): the hardware and software for transmission, such as Ethernet. Middle (protocols): the software for protocols such as TCP/IP. Top (applications): programs that get the work done, such as e-mail. |
| 6 |  | Discuss the hardware and software requirements of a LAN. Limit discussion to the names of components and their function as related to the LAN. |
| 7 |  | Discuss the advantages and disadvantages of a network with a standalone, single-user system, referring to hardware, software and the people involved. |
| 8 |  | Compare the requirements, benefits and limitations of LANs with WANs |
| 9 |  | Define electronic mail (e-mail). |
| 10 |  | Compare the advantages and disadvantages of e-mail with other forms of communication (post, telephone and fax) including speed, dependence on location, and the ability to facilitate individual and group communication. |
| 11 |  | Describe a client/server network system in reference to the concept of distributed or enterprise computing. The following indicates the limitations to the depth of description expected. Structured host-terminal (mainframe) networks have tended to give way to client-server networks (and associated mixes of systems, applications and databases) each with different protocols. Whereas client/server LANs link desktops in different areas with different needs, enterprise client/server computing links the LANs into an overall architecture, usually via groupware. An intranet uses Internet technology to take distributed, enterprise computing one step further by substituting an internal web for the groupware. The advantages are better sharing, easier publishing and JIT access to information. This is a change from centralized information management to distributed resource environments that are both local and global. |
| 12 |  | Suggest an etiquette (set of rules) for the use of e-mail, including the length of messages, tone, the use of the quote feature in replies and ethical considerations in regard to privacy. Reference should be made to 'spamming'. |
| 13 |  | Define groupware. |
| 14 |  | Describe one example of how groupware can be applied to the workplace. Examples: multi-user appointment books; project management; database management systems. |

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| Section | objective | Content |
| **2.1.2** |  | **Making the Connections (1h)** |
| 1 |  | Define network (information system). |
| 2 |  | Explain three advantages of networked information systems |
| 3 |  | Outline two disadvantages of networked information systems. |
| 4 |  | Discuss three social issues involving ethical considerations that can arise from the use of networked information systems. |

**2.2 Applications**

2.2.1 Software Fundamentals8

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| Section | objective | Section |
| **2.2** |  | **Input and Output (2h)** |
| 1 |  | Outline one function of each of any six input-only devices including mouse, CD-ROMs,  Scanners, microphones and digital cameras. |
| 2 |  | Outline one function of each of any six output-only devices including printers, speakers, LCD panels, plotters and VR goggles. |
| 3 |  | Outline five hardware tools that can act both as input and output devices including hard drives, tape drives, sound cards and recordable CD-ROMs. Other examples: diskettes and touch screens. |
| 4 |  | Explain three modifications to IT devices that are made to give physically-impaired people greater access to them. Consider modifications to both input and output devices such as microphones, Braille keyboards, speakers and mouth-held wands. Touch devices could also be included. Consider modifications that may not yet have been invented. |

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| Section | objective | Section |
| **2.2.1** |  | **Software (5h)** |
| 1 |  | Define software |
| 2 |  | Outline the differences between freeware, public domain, shareware and proprietary/commercial software. Students should be familiar with the legal protection and relative cost of each type of software |
| 3 |  | Describe integrated software. Students should be able to distinguish between integrated software, dynamic data linking and file transfer from software to software. |
| 4 |  | Describe the paper documents that are commonly found in software packages: user manual, registration card, warranty and copyright agreement. Include the function of each one. Students should be familiar with their functions through looking at the contents of commercial software packages and comparing the various components. |
| 5 |  | Explain two features of a software user interface that make it user friendly, including the use of visual metaphors of the real world. Items such as folders and desktop could be used. Refer to the fact that software also extends the capabilities of humans so that they can do things they could otherwise not do easily, or at all, by traditional means. There are many social consequences: GUIs are largely language independent, so they cross boundaries of nationality, age and literacy, making computers accessible to a very wide range of users, from those with special needs to very small children. |
| 6 |  | Outline two factors that need to be considered, other than hardware requirements, when installing software onto a personal computer. Students must be aware that there are system requirements, there is possible interference from virus checking software on installation, and that software on some systems requires a RAM allocation. Setup options can usually be used at a later date to configure the software to make it work with different options (e.g. changing printers; modifying printer quality). |
| 7 |  | Outline three factors that need to be considered when installing software onto a network including hardware requirements. Other examples: password protection of files establishing authorized access to various users; the difference between multi-user software and single-user software; economic (cost) and legal (licences) considerations. |
| 8 |  | Evaluate two ways in which individuals can be trained to use new software. Students should discuss self-taught methods such as reading the manuals, using tutorial software, and using help menus. Other methods include a trainer teaching an individual or a course on site, or a trainee attending a course off site. With the availability of the Internet on-line courses are also accessible. |
| 9 |  | Define interface. |
| 10 |  | Define computer-human interface |
| 11 |  | Discuss reasons for the evolution in the design of interfaces, from command-line based to graphically-based interfaces (GUIs). |
| 12 |  | Describe four features of GUIs including pull-down menus, icons and pointing devices. Other examples: windows and drag-and-drop. |
| 13 |  | Suggest three features that could be characteristic of future interfaces. This could include items such as integrated applications, natural language interfaces, intelligent agents and virtual reality interfaces. No technical details are required. The main point is that students should be able to justify their responses. |
| 14 |  | Suggest three characteristics of a computer-human interface design for a person who has special needs. Groups of people that could be considered include small children, physically or visually impaired individuals, the elderly and 'gamers'. The point is that designs should be justified. |
| 15 |  | Identify types of software appropriate to specified tasks. Examples include word processor, database, spreadsheet, multimedia, modeling and CAD/CAM DTP and Internet access. |
| 16 |  | Evaluate the use of paper documentation, on-line documentation and integrated-help menus. |
| 17 |  | Define bug. |
| 18 |  | Discuss the ethical considerations involved with software |

2.2.2 Databases and spreadsheets

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| Section | objective | Content |
| **2.2.2** |  | **Databases (5)** |
| 1 |  | Define database. |
| 2 |  | Define file. |
| 3 |  | Define record |
| 4 |  | Define field. |
| 5 |  | Describe the structure of a database. Include the features and functions of file, record and field. |
| 6 |  | Outline one application where it is most appropriate to use each of the following types of database: flat-file, relational and programmable. Technical details of their structure are not required. |
| 7 |  | Compare the structure and functions of spreadsheets and databases. Students frequently confuse these two applications. |
| 8 |  | Define database management system (DBMS). |
| 9 |  | Outline the functions of a database management system including queries, sorts, reports and maintenance. |
| 10 |  | Design a database with at least six fields. Students should be able to design a simple database using text, and numerical and date fields. For example, students often confuse entering a telephone number in a text field with entering it in a numerical field because a telephone number contains digits. |
| 11 |  | Compare three advantages and three disadvantages of paper files with electronic files. |
| 12 |  | Explain how databases can be used to solve two problems, including one involving a mail merge |
| 13 |  | Outline two characteristics of four special-purpose database software applications, including personal information managers, encyclopedias and library systems |
| 14 |  | Explain how the Boolean operators AND, OR and NOT can be used to search databases for specific information. |
| 15 |  | Outline how data can be transferred between a word processor, database and spreadsheet. |
| 16 |  | Discuss one situation where database management systems have been used in each of the following situations: school; business organization; leisure activity. The list of applications is extensive. Examples could be selected from a variety of sources such as school grading systems, hospital records, banking, airline reservations systems, etc. |
| 17 |  | Define data redundancy. |
| 18 |  | Define data integrity. |
| 19 |  | Discuss ethical issues of privacy and security that arise from the widespread use of databases, including the inappropriate collection and use of data, and the rights of the individual with respect to the storage of personal data. Include effects of legislation in your own country regarding access to, and use of, information. Students should reflect on the positive and negative outcomes that could result from all the world's databases containing information about them or their families. |

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| Section | objective | Content |
| **2.2.2** |  | **Spreadsheets (8h)** |
| 1 |  | Define spreadsheet. |
| 2 |  | Outline the components of a spreadsheet including rows, columns, formulas, formatting and macros. |
| 3 |  | Outline the major developments of spreadsheets from VisiCalc to modern spreadsheet software. |
| 4 |  | Apply equations in spreadsheets to solve common problems including the processes of addition, subtraction, multiplication, division and the calculation of totals, means and character manipulation. Students should be familiar with formulas that can be defined both as a calculation and using predefined functions. For example, the sum of cells A1 to A5 could be defined as =A1+A2+A3+A4+A5 or as =SUM (A1...A5) Questions requiring students to write formulas will define the syntax. Students should be made aware that generally the syntax used by all spreadsheets performs similar functions |
| 5 |  | Predict the outcomes of changing the contents of cells in spreadsheets and the results obtained if given a simple spreadsheet formula. Only simple arithmetic manipulations will be expected. |
| 6 |  | Suggest two possible future developments in spreadsheet software. |
| 7 |  | Discuss one situation where spreadsheets have been used to solve problems for each of the following: individuals, communities, and institutions/organizations. list of such applications is extensive. Examples could be selected from a variety of sources such as financial, statistical calculations, scientific measurements, etc. |
| 8 |  | Design a spreadsheet to solve a simple problem. Students may be asked to solve a simple problem by suggesting numbers of rows and columns, titles and information to be entered in various cells of a spreadsheet. Answers could involve labels, numbers, formulas for numerical calculation, character manipulation |
| 9 |  | Discuss the possible ethical considerations arising from a total dependence on spreadsheets.  Students need to be aware that they must have a way of 'testing' if results in the cells of a spreadsheet are correct. They need to examine spreadsheet results by the 'does it make sense' rule, and sample cells checked by calculator or against known results. |

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| **Section** | **objective** | Content |
| **2.2.2** |  | **Information Systems (2h)** |
| 1 |  | Define information. |
| 2 |  | State five examples of sets of data that may be used in information systems.  Students should discuss specific information systems in businesses, institutions and organizations. Consider the kinds of data common to various businesses, and how data could vary between two types of businesses such as a bank and airline company. |
| 3 |  | List four specific items of data that may be contained in any one of the sets of information 2 |
| 4 |  | Describe the four components of an information system.  These are input, processing and storage devices, together with processing software. Details of how each transforms or deals with data are not required |
| 5 |  | Discuss four processing functions of the software in an information system.  Examples: input with value checking; searching or selecting; analysing and reporting. |
| 6 |  | Compare the meaning of the terms data, information, knowledge and wisdom.  See definitions in Appendix 1: Glossary of ITGS Terms. |
| 7 |  | Compare the terms 'computer abuse' and 'computer crime'.  Students should know several examples of each |

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| **Section** | **objective** | Content |
| **2.2.2** |  | **An Information Economy (1h)** |
| 1 |  | State three examples where information has economic value. |
| 2 |  | Explain how information can be a commodity with economic value. |
| 3 |  | Compare a production economy with an information economy |

2.2.3word processing and desktop publishing

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| Section | objective | Content |
| **2.2.3** |  | **Word Processing and Desktop Publishing (6h)** |
| 1 |  | Define word processing. |
| 2 |  | List three font formatting functions that can be carried out by most word processors. |
| 3 |  | Describe one efficient method of changing a word-processed document that is A4 formatted so that it fits legal-size paper |
| 4 |  | Define white space. |
| 5 |  | Define ASCII |
| 6 |  | Define text format. |
| 7 |  | State how the number of bytes equates to the number of characters. |
| 8 |  | State how the number of bits equates to the number of bytes. Students should understand the relationship between bit, byte, kilobyte, megabyte, gigabyte, terabyte and other current terminology. |
| 9 |  | Outline two errors in a text that would be corrected by a spelling checker. |
| 10 |  | Explain two errors in a text that would not be corrected or detected by a spelling checker. |
| 11 |  | State two examples of text that, although correct, would be 'flagged' as errors by a spelling checker. |
| 12 |  | Explain the function of a thesaurus. |
| 13 |  | Discuss at least two ethical considerations that can arise from the use of spelling checkers and grammar checkers. |
| 14 |  | Outline how OCR software can 'input' a text document into a word processor. |
| 15 |  | Discuss the requirements necessary before a paperless society could exist. |
| 16 |  | Suggest the ways in which a computer could be modified so that a person with no arms could use a word processor |
| 17 |  | Describe two pieces of additional hardware, beyond what is normally required for a word processor, necessary to support DTP. Examples: large high resolution screen; high quality printer; scanner. |
| 18 |  | Explain the importance of high resolution printers for DTP. |
| 19 |  | Compare a total of three advantages and/or disadvantages of a word processor with those of a DTP package |
| 20 |  | Compare three advantages and/or disadvantages of using DTP to publish (print) a given document with using the services of a commercial printer. |
| 21 |  | Design a publication using DTP. Students should be able to design a simple publication that consists of at least three pages that should include text and graphics, and should meet the requirements of a design brief. |
| 22 |  | Describe the historical development of DTP. DTP emerged with the introduction of word processors capable of including graphics and DTP programs, and accelerated with the availability of laser printers. |
| 23 |  | Define intellectual property. |
| 24 |  | Define copyright |
| 25 |  | Suggest possible legal and economic consequences arising from copying intellectual property by scanning and from extracting information from printed materials. Reference should be made to copyright notices inside books and magazines and to the use of information from the Internet. Students must be made aware of an acceptable bibliographic form for citing sources of information. |
| 26 |  | Discuss the ethical considerations arising from the copying of intellectual property. |

2.2.4 Images, sound and presentations

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| Section | objective | Content |
| **2.2.3** |  | **Graphics (3h)** |
| 1 |  | Define pixel. |
| 2 |  | Explain how 8 bits per pixel can produce 256 shades of grey or color. |
| 3 |  | List five formats for storing a graphical image including BMP, GIF and JPG (JPEG). Other formats include TIF or TIFF, WPG, PIC and PIX. The full names are not required, nor the technical details of how images are compressed and stored. |
| 4 |  | Outline the difference between bitmapped and object-oriented graphics with respect to the appearance, editing, storage and transmission of images. Bitmapped graphics represent an image by a series of bits which may appear with jagged edges. Object-oriented graphics represent an image by a series of lines or vectors and have smooth edges. Bitmapped graphics cannot be enlarged or condensed without loss of image quality. There can be a difference in the storage size of bitmap and object-oriented images which results in a difference in transmission times. Technical details of software are not required. |
| 5 |  | Evaluate the implications of the appearance, and of the storage of images, with different degrees of colour. |
| 6 |  | Compare the quality of graphics necessary for output to a monitor and to a laser printer. |
| 7 |  | Describe an efficient method of getting a coloured picture from a book into a computer system. |
| 8 |  | Discuss three methods that could be used to take a photograph and input the image into a computer, including the use of a digital camera and a photograph on a CD-ROM. Others include scanning a photograph or inputting a still from a video camera. |
| 9 |  | Define computer-aided design (CAD). |
| 10 |  | Outline two advantages and two disadvantages of using CAD instead of traditional drawing methods such as freehand. Consider the skills required, storage, complexity and styles of the drawings; interfacing with other aspects of IT time and cost. |
| 11 |  | Describe two examples of design situations that employ IT. |
| 12 |  | Discuss the ethical issues involved in storing art work in electronic form. |

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| Section | objective | Content |
| **2.2.4** |  | **Sound Processing (1h)** |
| 1 |  | List three ways in which sound can be inputted into a computer including microphone, MIDI interface and files from the Internet. Another way is via a CD. |
| 2 |  | Suggest possible political and cultural consequences arising from copying intellectual property by copying voice patterns and music from a variety of sources and reproducing them in digital form. This could involve: bugging politicians; using re-digitized voices for blackmail; entrance to 'sensitive' areas; creating 'new music' electronically by modifying or combining earlier works of music. |

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| Section | objective | Content |
| **2.2.4** |  | **Multimedia Presentations (4h)** |
| 1 |  | Define hypertext. |
| 2 |  | Define multimedia. Students should be able to distinguish between hypermedia and multimedia. |
| 3 |  | List five media elements included in a typical multimedia program including text, images, sound and video. |
| 4 |  | Describe the hardware needed to create multimedia |
| 5 |  | Describe presentation software. |
| 6 |  | Describe two advantages and two disadvantages of using presentation software as opposed to traditional lecture methods. |
| 7 |  | layout, clear navigating tools, image map, and attention to text clarity. Students should understand general guidelines about the use of fonts, graphics, white space, sound, animation and video. They could examine commercial multimedia products and discuss elements that contribute towards a good multimedia product compared with one of poor quality. This assessment statement can also relate to Web page design. Discuss principles of good design for multimedia programs including consistency of screen |
| 8 |  | Define storyboard. |
| 9 |  | Explain why file compression is so important for the storage of music/sound, images and video. |
| 10 |  | Discuss the benefits and limitations of using printed documents as opposed to multimedia. Limit discussion to a total of six features (advantages/disadvantages). |
| 11 |  | Discuss one benefit and one drawback that the use of multimedia encyclopedias and information sources have on each of the following groups: individuals, communities and institutions/organizations. Students need to reflect on the consequences of relying only on one type of information source. The use of CD-ROM information sources should also be compared with accessing information on the Internet. |
| 12 |  | Suggest possible environmental, economic and psychological consequences arising from copying intellectual property by duplicating images and video from a variety of sources and reproducing in digital form. Effects involving health, environment and psychological well-being can be studied. Students should discuss what constitutes 'intellectual property' and ownership rights of the originator. Discuss which computer crimes can be related to the copying and modifying of text, images, sound and video. Examples may include entrance to 'sensitive areas' and altering electronically stored art work |
| 13 |  | Explain circumstances when it is acceptable for an individual to duplicate and incorporate the intellectual property of another person. This includes copying text, images, sound and video as well as downloading images from the Internet. Students should be familiar with the fair use policy statement that, for the reproduction of all printed materials, where the use is non-profitable, the source must be documented and the author notified. |

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| Section | objective | Content |
| **2.2.4** |  | **Visual and Performing Arts (1h)** |
| 1 |  | Discuss two ways IT is used in each of the following areas: film, music, art, theatre and dance. Include: special effects, colourizing black and white film, midi technology in music, theatre set design, graphics and photographic manipulation in art, modelling and simulation in dance. |
| 2 |  | Suggest the possible social significance of digital TV with respect to the effect on people's leisure time, including attendance at live theatrical and musical events. |

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| Section | objective | Content |
| **2.2.4** |  | **Virtual Reality and Games (2h)** |
| 1 |  | Define virtual reality (VR). |
| 2 |  | Outline three applications of VR. |
| 3 |  | Explain how computer games can incorporate aspects of VR, with reference to two examples. |
| 4 |  | Describe the developments and trends that have occurred in computer games including high resolution graphics, QuickTime video, game levels and networked games |
| 5 |  | Discuss the possible social consequences for individuals, communities and institutions/organizations arising from the widespread use of computer games. |
| 6 |  | Discuss situations involving ethical considerations that can arise from the use of computer games with respect to economic, cultural and psychological effects |

2.2.5 Modeling and simulations

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| Section | objective | Content |
| **2.2.5** |  | **Modelling and Simulations (2h)** |
| 1 |  | Define modeling |
| 2 |  | Define simulation. |
| 3 |  | Outline two different ways of doing modelling, including the use of special purpose software. Other ways include spreadsheets. |
| 4 |  | Describe four situations that use simulation software including flight simulators, and modeling ecological and financial systems. Other situations include structural engineering and designing |
| 5 |  | Discuss three benefits and two limitations of models. |

2.2.6 Tutorials, training and wizards (assistants)

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| Section | objective | Content |
| **2.2.6** |  | **Tutorial and Training and wizards (2h)** |
| 1 |  | Define tutorial software. |
| 2 |  | Define training software. |
| 3 |  | Explain the principles involved in the way wizards accomplish various tasks, including drawing charts using spreadsheet software, producing reports using database management systems and setting a mail merge. |
| 4 |  | Discuss how the various applications of tutorial and training software can help both developed and developing countries in the areas of business, industrial training and classroom teaching. Consider both distance learning and on-site computer-aided learning (CAL). |
| 5 |  | Discuss the possible consequences of the widespread use of training software in the classroom. Consider the number of teachers, their skills and styles of teaching as well as hardware, software and network needs, and the design of buildings. |
| 6 |  | Compare traditional teaching methods with training software in three specific situations including flight training and learning a word processor package. |

**.3 Communication Systems**

2.3.1 The Internet

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| Section | objective | Content |
| **2.3.1** |  | **The Internet (7h)** |
| 1 |  | Define the Internet. |
| 2 |  | Outline the main services found on the Internet including e-mail, listservs, newsgroups, FTP and the World Wide Web |
| 3 |  | Explain the relationship of the World Wide Web to the Internet. |
| 4 |  | Explain the importance of protocols to such networks. |
| 5 |  | Define bandwidth. |
| 6 |  | Define ISDN. |
| 7 |  | Compare the feasibility of a dial-up connection, requiring a modem, with the use of a leased line or ISDN. |
| 8 |  | Explain the importance of the transmission speed of modems in reference to baud rate and bits per second (bps). |
| 9 |  | Define URL. |
| 10 |  | Define HTML. |
| 11 |  | Define HTTP. |
| 12 |  | Discuss the features of a Web browser including hyperlinks, GUIs, and integration of other Internet services. |
| 13 |  | Define search engine. |
| 14 |  | Suggest two strategies for limiting a key word search in a search engine. For example, follow suggestions for finding information in the engine Help section. |
| 15 |  | Annotate addresses such as http://www.ibo.org to show the meaning of each part |
| 16 |  | Suggest etiquette (set of rules) for controlling access to Web sites that contain information considered immoral or unethical. Issues such as pornography, promotion of illicit drug use, incitement to violence or hate, religious intolerance or other materials you and/or the students consider inappropriate. |
| 17 |  | Discuss the means involved in blocking access to 'objectionable' material on the Internet. Filtering products are currently available to both block and monitor Internet access. In some cases, blocking access to 'questionable' sites also involves limiting the amount of time a person can devote to 'surfing'. This is usually the case with an issue associated with censorship. The balance between 'appropriate use policies' as opposed to filters can be discussed here. |
| 18 |  | Define intranet. |
| 19 |  | Discuss four advantages of using an intranet in a school or business including cost effectiveness, open standards and user creation of content. Other examples: distributed publishing; efficient transfer of information; a simple universal interface. |
| 20 |  | Compare the economic, legal and political significance of the Internet with an intranet. Limit to the benefits of an intranet as compared with the Internet. |
| 21 |  | Evaluate possible ethical considerations that could arise from the disparity between IT-rich and IT-poor nations with respect to the degree of access to the Internet and the reliability of this access. |
| 22 |  | Discuss the increased risk of computer crime and infection by worms arising from the widespread use of networks |
| 23 |  | Compare the just-in-case (JIC) model of information delivery with the just-in-time (JIT) model with respect to institutions/organizations. |
| 24 |  | Suggest the possible social significance of, and ethical considerations arising from, new developments in Internet technology, including network computers (NCs), Web crawlers and Java. Students should consider the types of information that can be presented and collected on Web pages. Although robots are commonly associated with hardware intomation, they can be software tools as well. See definitions in Appendix 1: Glossary of ITGS Terms. |
| 25 |  | Define cryptography |
| 26 |  | Discuss the ethical considerations involved in the use of encryption on the Internet. |

**2.3.2 Personal and Public Communications**

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| Section | objective | Content |
| **2.3.2** |  | **Personal and Public Communications (3h)** |
| 1 |  | Describe how telephone technology and IT have converged including digital switching, cellular digital telephones, call id, call forward and storage of frequently dialled numbers. |
| 2 |  | Compare the benefits and limitations of communicating via fax, e-mail, voice telephone and traditional postal services. |
| 3 |  | Explain two ways in which each of the following devices can improve personal productivity: voicemail, pagers and personal digital assistants. |
| 4 |  | Outline the requirements concerning rates of data transmission to enable realistic tele-conferencing and video-conferencing. |
| 5 |  | Discuss the social significance of the increasing use of portable communications devices including the environmental impact of relay stations, the consequences of using up communication wavelengths, and psychological and cultural effects. |
| 6 |  | Discuss the impact that tele-conferencing and video-conferencing have had on business, and can have on education, including the significance of economic and organizational factors. Examples: the number of people that can attend; moving people from different countries; no physical space required to accommodate people; increased productivity. Worth mentioning: social impact on geographically or physically isolated individuals such as the disabled or hospitalized. |
| 7 |  | Evaluate the possible ethical considerations that could arise from the disparity between IT-rich and IT-poor nations with respect to the availability of tele-conferencing and video-conferencing. |
| 8 |  | Suggest possible psychological and cultural consequences arising from the use of tele-conferencing and video-conferencing with respect to personal communications including voice, tone, inflections, timing and body language. |
| 9 |  | Discuss the environmental effects that have resulted from the proliferation of satellite-based communications |

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| Section | objective | Content |
| **2.3.2** |  | **Broadcast Media (2h)** |
| 1 |  | Outline how radio and computer technologies have converged with reference to the ability of computers to receive radio signals, and with reference to computer-controlled radio libraries and recording studios. |
| 2 |  | Define teletext. |
| 3 |  | Describe the hardware and software components required for video-on-demand. |
| 4 |  | Outline three examples where television and computer technologies have converged, including access to radio and television broadcasts over the Internet. |
| 5 |  | Discuss situations involving ethical considerations that arise from the convergence of computing and broadcasting technologies. Terms such as 'push' and 'pull', with reference to information or broadcasts that people receive, may be used in this context. 'Push' is defined loosely as 'unrequested' information. |

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| Section | objective | Content |
| **2.3.2** |  | **Non-broadcast Media (1h)** |
| 1 |  | Discuss the impact that the developments and trends in DTP software and hardware have had on the publishing industry. |
| 2 |  | Describe three examples of the ways in which the publishing industry uses computer technology to provide information in a paperless medium including encyclopedias on CD-ROM and Internet versions of reading material. Other examples are audio books and interactive CDs. |

**2.4 Integrated Systems**

**2.4.1Robotics**

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| Section | objective | Content |
| **2.4.1** |  | **Robotics,(3h)** |
| **1** |  | **State Asimov's three 'laws' of robotics.** |
| 2 |  | Explain which 'law' of robotics would apply in any appropriate situation. 'Law' in this situation should not be equated with a scientific law. Students should be able to analyze given situations and suggest hypothetical laws of their own. |
| 3 |  | Discuss the appropriateness of using robots to accomplish various tasks. Students should be able to analyze given situations and specify ones of their own. |
| 4 |  | Discuss situations involving ethical considerations that can arise from the use of robots in place of people with respect to economic, cultural and psychological effects. |
| 5 |  | Define Turing test. |
| 6 |  | Discuss various definitions of artificial intelligence (AI). Students should compare definitions from various IT dictionaries and other sources, and also try to develop a definition themselves. They should also discuss which kinds of software use AI and which do not (e.g. word processors and chess-playing programs). |
| 7 |  | Explain the importance of the Turing test to the debate about whether machines can think. Turing tests can be simulated (and adapted); they can be obtained from the Web (ELISA). |
| 8 |  | Discuss the issues related to the concept of whether machines can learn. |
| 9 |  | Evaluate the use of AI in at least one situation. A typical situation would be the way in which chess-playing software could use AI to defeat a human opponent. |
| 10 |  | Define expert system. |
| 11 |  | Explain the concept of 'fuzzy logic/rules' and its dependence on knowledge bases. This requires some element of dynamic learning. |
| 12 |  | Describe how expert systems can be used in each of the following situations: financial transactions, games and writing plays. Very often there are 'intelligent' prompts based on responses or inputs by the user. Game development is an obvious example. Play writing often has a number of options that can be incorporated when developing a plot or the character of an individual |

**2.4.2 Artificial Intelligence**

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| **Section** |  | Content |
| **2.4.2** |  | **Artificial Intelligence and expert systems (2h)** |
| 1 |  | Describe two situations where it is more appropriate to use a machine than a person. |
| 2 |  | Describe two situations where it is more appropriate to use a person than a machine |
| 3 |  | Explain the beneficial attributes of both machines and people for performing particular tasks.  These include stamina, memory, accuracy, speed, the need for breaks, patience, interpretation of results, and working in dangerous situations. This list is not exhaustive and should be discussed using actual contexts. Quantitative comparisons are not expected. |
| 4 |  | Discuss the characteristics of computers that assist humans in performing complex tasks including preparing budgets, creating address books, manipulating images and editing videos.  Technical references to internal components are not required. |
| 5 |  | Discuss three situations involving ethical considerations that can arise from the use of machines/computers in place of people including the field of medicine.  You are free to choose the other two situations. Other situations involving ethical issues are: education (e.g. machine as opposed to teacher marking); estimating the skills and/or performance of people (e.g. driving proficiency); computer-aided manufacturing. |